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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,180	02/17/2004	Stefan Wendt	5284-34	1734

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COHEN, PONTANI, LIEBERMAN & PAVANE
Suite 1210
551 Fifth Avenue
New York, NY 10176

EXAMINER	
TIMORY, KABIR A	
ART UNIT	PAPER NUMBER
2609	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)
	10/780,180	WENDT ET AL.
	Examiner	Art Unit
	Kabir A. Timory	2609

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,10-12, 15 and 16-19* is/are rejected.

7)☒ Claim(s) *5-9,13,and 14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 4/2/2004(2/17/2004.)

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The abstract of the disclosure is objected to because it exceeds 150 words. Correction is required. See MPEP § 608.01(b).

2.

Claim Objections

3. Claim 15 is objected to because of the following informalities:

(1) Claim 15, line 2, the term **"may be"** should be changed to a definite term such as **--is--**.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 16-19 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 16, 17, 18, and 19 recite a "computer program" which does not impart functionality to a computer or computing device, and is thus considered nonfunctional descriptive material. Such nonfunctional descriptive material, in the absence of a functional interrelationship with a computer, does not constitute a statutory process, machine, manufacture or composition of matter and is

thus non-statutory per se. Thus, in the specification it is not clearly defined how the "program" is stored in a tangible medium paragraph [63]. Moreover, claims 16, 17, and 19 define "computer executable instructions" that ties with the "computer program" which also encompasses non-statutory subject matter. Also, claim 18 define "a data carrier" that ties with the "computer program" which also encompasses non-statutory subject matter and therefore does not fall within one of the four statutory classes of § 101.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-4, 10-12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schramm et al. (US Patent Number 5,768,307) in view of Krasny et al. (US Pub. 2003/0054845).

Regarding claim 1:

As shown in figure 2, Schramm et al. discloses a signal processing apparatus operable to represent the effects on a received signal of a radio communications channel having L paths (figure 6),

- each path having an average attenuation and a pre-determined respective delay (figure 5, 54),
- wherein the received signal includes a combination of correlated components (figure 5) determined from an effect of pulse shaping filters on the received signal (column 17, lines 62-67 & column 18 lines 1-5),
- each correlated component having a correlation coefficient representing a correlation of the received signal component with respect to each of the other components (figure 5),
- the signal processing apparatus comprising a plurality of signal simulators (figure 6), each simulator generating a signal component value proportional to a complex zero mean Gaussian random variable having a pre- determined variance (column 11, lines 55-59), and
- a summer operable to sum the signal component values produced from each signal simulator, to form a representation of the signal received via the radio communications channel (figure 1, 6),

Schramm et al. discloses all of the subject matter as described above except for specifically teaching the variance of each of the signal simulators is pre-determined by calculating the Eigen values of a matrix formed from the correlation coefficients and from a channel correlation matrix which includes the average attenuation of each of the L paths.

However, Krasny et al., in the same field of endeavor, teaches the variance of each of the signal simulators is pre-determined by calculating the Eigen values of a

matrix formed from the correlation coefficients and from a channel correlation matrix (paragraphs 0038 and 0039) which includes the average attenuation of each of the L paths (paragraphs 0026, lines 1-5).

One of ordinary skill in the art would have clearly recognized that each received signal or sequence is N samples long and can be represented in a matrix form where the columns of the matrix are the signal vectors corresponding to each delayed multipath components of the received signal. In order to determine the variance of each received signal, it would have been obvious to one of ordinary skill in the art at the time the invention was made to calculate the Eigen values of a matrix which is formed from the correlation coefficients, and from a channel correlation as taught by Krasny et al. Calculating the Eigen values of a matrix, provides simpler calculation and less complicated simulation process.

Regarding claim 2:

Schramm et al. further discloses number of signal simulators is less than the number of paths L of the radio communications channel (figure 6, column 4, lines 40-44).

Schramm et al. discloses all of the subject matter as described above except for specifically teaching the number of signal simulators being determined from the number of Eigen values above a pre-determined threshold, each Eigen value above the threshold forming the pre-determined variance for a corresponding signal simulator.

However, Krasny et al., in the same field of endeavor, teaches the number of signal simulators being determined from the number of Eigen values above a pre-

determined threshold (number of multipath components is interpreted to be the number of signal simulators) (paragraphs 45 & 46), each Eigen value above the threshold forming the pre-determined variance for a corresponding signal simulator (number of multipath components is interpreted to be the number of signal simulators) (paragraphs 45 & 46).

One of ordinary skill in the art would have clearly recognized that each received signal or sequence is N samples long and can be represented in a matrix form where the columns of the matrix are the signal vectors corresponding to each delayed multipath components of the received signal. In order to determine the variance of each received signal, it would have been obvious to one of ordinary skill in the art at the time the invention was made to calculate the Eigen values of a matrix which is formed from the correlation coefficients, and from a channel correlation as taught by Krasny et al. Calculating the Eigen values of a matrix, provides simpler calculation and less complicated simulation process.

Regarding claim 3:

Schramm et al. further discloses correlated components from which the received signal is formed are representative of components formed from respective correlators of a rake receiver (figure 1, 1 & 4a ,4b),

- the received signal being a spread spectrum signal (column 8, lines 23-26),
- the correlation coefficients representing a correlation of the output signal of each correlator with respect to the output of the other correlators (figure1, 4 ,4b, column 3, lines 18-22)

Regarding claim 4:

Schramm et al. further discloses the signal component value produced by each signal simulator is formed from a squared magnitude (figure 3, 20-1) of the zero mean complex Gaussian random variable (column 11, lines 55-59).

Regarding claim 10:

As shown in figure 2, Schramm et al. discloses a method of representing the effects of a radio communications channel having L paths on a received signal (figure 6),

- each path having an average attenuation and a pre-determined respective delay (figure 5, 54),
- wherein the received signal includes a combination of correlated components (figure 5) determined from an effect of pulse shaping filters on the received signal (column 17, lines 62-67 & column 18 lines 1-5),
- each correlated component having a correlation coefficient representing a correlation of the received signal component with respect to each of the other components (figure 5),
- the method comprising generating a plurality of complex zero mean Gaussian random variables each having a pre-determined valiance (column 11, lines 55-59), and
- summing the variables, to form a representation of the signal received via the radio communications channel (figure 1, 6).

Schramm et al. discloses all of the subject matter as described above except for specifically teaching the pre-determined variance of each variable is calculated from the Eigen values of a matrix formed from the correlation coefficients and from a channel correlation matrix which includes the average attenuation of each of the L paths.

However, Krasny et al., in the same field of endeavor, teaches the pre-determined variance of each variable is calculated from the Eigen values of a matrix formed from the correlation coefficients and from a channel correlation matrix (paragraphs 0038 and 0039) which includes the average attenuation of each of the L paths (paragraphs 0026, lines 1-5).

One of ordinary skill in the art would have clearly recognized that each received signal or sequence is N samples long and can be represented in a matrix form where the columns of the matrix are the signal vectors corresponding to each delayed multipath components of the received signal. In order to determine the variance of each received signal, it would have been obvious to one of ordinary skill in the art at the time the invention was made to calculate the Eigen values of a matrix which is formed from the correlation coefficients, and from a channel correlation as taught by Krasny et al. Calculating the Eigen values of a matrix, provides simpler calculation and less complicated simulation process.

Regarding claim 11:

Schramm et al. further discloses the number of complex zero mean Gaussian random variables is less than the number of paths L of the radio communications channel (figure 6, column 11, lines 55-59).

Schramm et al. further discloses all of the subject matter as described above except for specifically teaching the number of variables being determined from the number of Eigen values which are above a pre-determined threshold, each Eigen value above the threshold forming the variance for a corresponding one of the Gaussian random variables.

However, Krasny et al., in the same field of endeavor, the number of variables being determined from the number of Eigen values which are above a pre-determined threshold (number of multipath components is interpreted to be the number of variables) (paragraphs 45 & 46), each Eigen value above the threshold forming the variance for a corresponding one of the Gaussian random variables (paragraph 0026, lines 1-5).

One of ordinary skill in the art would have clearly recognized that each received signal or sequence is N samples long and can be represented in a matrix form where the columns of the matrix are the signal vectors corresponding to each delayed multipath components of the received signal. In order to determine the variance of each received signal, it would have been obvious to one of ordinary skill in the art at the time the invention was made to calculate the Eigen values of a matrix which is formed from the correlation coefficients, and from a channel correlation as taught by Krasny et al. Calculating the Eigen values of a matrix, provides simpler calculation and less complicated simulation process.

Regarding claim 12:

Schramm et al. further discloses forming a squared magnitude (figure 3, 20-1) of the zero mean complex Gaussian variable, before summing to form the representation of the received signal (figure 3, column 11, lines 55-59).

Regarding claim 15:

As shown in figure 2, Schramm et al. discloses a method of simulating a radio communications channel, comprising:

- identifying a number of paths L via which a signal is received from the radio communications channel (figure 6),
- determining an average attenuation and a pre-determined delay with respect to a first of the paths of a communicated radio signal for each of the paths (figure 5, 54),
- determining a plurality of correlation (figure 5) coefficients from an effect of pulse shaping filters on the received signal (column 17, lines 62-67 & column 18 lines 1-5),
- a signal component value proportional to the complex zero mean Gaussian random variable having the calculated variance (column 11, lines 55-59), and
- summing the signal component values produced for each path, to form a representation of a signal received via the radio communications channel (figure 1, 6).

Schramm et al. discloses all of the subject matter as described above except for specifically teaching forming a matrix from the correlation coefficients introduced by the pulse shaping filters and from a channel correlation matrix which includes the average attenuation of each of the L paths, for each of the paths of the radio channel, calculating

a variance of a complex zero mean complex Gaussian process from the Eigen values of the formed matrix, generating, for each path, to form a representation of a signal received via the radio communications channel.

However, Krasny et al., in the same field of endeavor, teaches forming a matrix from the correlation coefficients introduced by the pulse shaping filters and from a channel correlation matrix which includes the average attenuation of each of the L paths (paragraph 0034), for each of the paths of the radio channel, calculating a variance of a complex zero mean complex Gaussian process from the Eigen values of the formed matrix, generating, for each path, to form a representation of a signal received via the radio communications channel (paragraphs 0026, lines 1-5).

One of ordinary skill in the art would have clearly recognized that each received signal or sequence is N samples long and can be represented in a matrix form where the columns of the matrix are the signal vectors corresponding to each delayed multipath components of the received signal. In order to determine the variance of each received signal, it would have been obvious to one of ordinary skill in the art at the time the invention was made to calculate the Eigen values of a matrix which is formed from the correlation coefficients, and from a channel correlation as taught by Krasny et al. Calculating the Eigen values of a matrix, provides simpler calculation and less complicated simulation process.

Allowable Subject Matter

7. Claims 5, 6, 7,8, 9, 13, and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record, Schramm et al. does not teach or suggest each of

the paths L of the multi-path channel i have parameters $(\lambda_i, \tau_i)_{0 \leq i < L}$, where λ_i is the average attenuation of path i having the delay τ_i with respect to a first of the paths, and the summer provides a representation of the received signal r for an input signal s represented by the equation:

$$r = s\sum_{i=0}^{L-1}|Y_i|^2$$

where $|Y_i|^2$ is the squared magnitude of the complex zero mean gaussian random variable produced by the i-th signal simulator, the gaussian random variable having the pre-determined variance μ_i calculated from the eigen values $(\mu_i)_{0 \leq i < L}$ of the matrix formed matrix $\lfloor(\rho_{ij})_{0 \leq i,j < L}\rfloor \cdot Diag\lfloor(\lambda_i)_{0 \leq i,j < L}\rfloor$, where ρ_{ij} are the L correlation coefficients, and $Diag\lfloor(\lambda_i)_{0 \leq i,j < L}\rfloor$ is the channel correlation matrix for independent paths.

The prior art of record, Schramm also does not teach a channel simulator for representing a radio communications channel in accordance with a markov model, the channel simulator comprising a plurality of channel states representing the states of the radio communications channel, a transition between states being determined according to transition probabilities, wherein the transition probabilities are determined from the

effects of the radio communications channel represented by the signal processing apparatus.

The prior art of record, Schramm also does not teach each of the paths L of the

multi-path channel i have parameters $(\lambda_i, \tau_i)_{0 \le i < L}$, where λ_i is the average attenuation of path i having a delay τ_i with respect to a first of the paths, the summing producing the representation of the received signal r for an input signal s according to the equation:

$$r = s\sum_{i=0}^{L-1}|Y_i|^2$$

where $|Y_i|^2$ is the squared magnitude of the i-th complex zero mean gaussian random variable, the gaussian random variable having the pre-determined variance μ_i calculated from the eigen values $(\mu_i)_{0 \le i < L}$ of the formed matrix $\lfloor(\rho_{ij})_{0 \le i, j < M}\rfloor \cdot Diag\lfloor(\lambda_i)_{0 \le i, j < L}\rfloor$, where ρ_{ij} are the M correlation coefficients, and $Diag\lfloor(\lambda_i)_{0 \le i, j < L}\rfloor$ is the channel correlation matrix for independent paths.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kabir A. Timory whose telephone number is (571) 270-1674. The examiner can normally be reached on Mon - Thu 6:30AM - 4:00PM & Fri 6:30AM - 3:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on (571) 272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kabir A. Timory
February 27, 2007

Shuwang Liu

SHUWANG LIU
SUPERVISORY PATENT EXAMINER